

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims:

1 (Currently Amended). A display device providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual sub-fields that are defined by dividing one field and arranged on a time base in a prescribed order, said sub-fields being weighted to represent gray ~~levels:~~
levels;

wherein said plurality of sub-fields are weighted in such a way that at least one non-display gray level which cannot be displayed by combining said plurality of sub-fields is arranged between displayable gray levels by combining said plurality of sub-fields,

and wherein said display device comprises,

a diffuser that receives said video signal for, when said video signal represents said non-display gray level, diffusing temporally and/or spatially a difference between said non-display gray level and one of said display gray levels so that said non-display gray level can be equivalently displayed with said display gray levels;

a sub-field corresponder that converts a video signal representing one field output from said diffuser into a video signal representing individual sub-fields; and

an emitter that controls said pixels on said display panel so that each pixel emits light or does not emit light in said individual sub-fields, in accordance with said video signal representing said individual sub-fields output from said sub-field corresponder.

2 (Previously Presented). The display device according to claim 1, wherein said diffuser includes:

a gray level converter that converts said non-display gray level into one of said display gray levels that is close to said non-display gray level, and

an error diffuser that diffuses, when said non-display gray level is converted into said one of said display gray levels by said gray level converter, a difference between said non-display gray level and said one of said display gray levels to pixels around a pixel having said non-display gray level.

3 (Withdrawn). The display device according to claim 1, wherein said diffuser includes:

a dither diffuser that alternately adds or subtracts a difference between said non-display gray level and one of said display gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

4 (Withdrawn). The display device according to claim 1, wherein at least two continuous non-display gray levels are included between said display gray levels, and

said diffuser includes:

a dither diffuser that alternately adds or subtracts a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

a gray level converter that converts another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level

among said display gray levels and a gray level rendered displayable by said dither diffusion means,
and

an error diffuser that diffuses, when said another non-display gray level is converted by said gray level converter, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

5 (Withdrawn). The display device according to claim 1, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display device further comprises,

a lower diffuser that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level,
and

a selector that selects an output of said diffuser when the gray level of the digital video signal output from said lower diffuser is not less than the minimum value of said non-display gray level and for selecting an output of said lower diffuser when the gray level of the digital video signal output from said lower diffuser is less than the minimum value of said non-display gray level and for outputting the selected output to said sub-field corresponder.

6 (Withdrawn). The display device according to claim 1, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display device further comprises,

a lower diffuser that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

a selector that selects the digital video signal not yet diffused by said lower diffuser when the gray level of the digital video signal output from said lower diffuser is not less than the minimum value of said non-display gray level and for selecting an output of said lower diffuser when the gray level of the digital video signal output from said lower diffuser is less than the minimum value of said non-display gray level,

and wherein said diffuser includes a dither diffuser that receives the digital video signal output from said selector, for alternately adding or subtracting a difference between said non-display gray level and a display one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

7 (Withdrawn). The display device according to claim 1, wherein said video signal is a digital video signal expressed by a plurality of bits,

at least two continuous non-display gray levels are included between said display gray levels, and wherein said display device further comprises,

a lower diffuser that receives said digital video signal, for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level,

a selector that selects an output of said diffuser when the gray level of the digital video signal output from said lower diffuser is not less than the minimum value of said non-display gray level and for selecting an output of said lower diffuser when the gray level of the digital video signal output from said lower diffuser is less than the minimum value of said non-display gray level, and

a dither diffuser that receives the digital video signal output from said selector, for alternately adding or subtracting a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

said diffuser includes:

a gray level converter that converts another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a gray level rendered displayable by said dither diffuser, and

an error diffuser that diffuses, when said another non-display gray level is converted by said gray level converter, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

8 (Previously Presented). A display method for providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual sub-fields that are defined by dividing one field and arranged on a time base in a prescribed order, said sub-fields being weighted to represent gray levels;

wherein said plurality of sub-fields are weighted in such a way that at least one non-display gray level which cannot be displayed by combining said plurality of sub-fields is arranged between displayable gray levels by combining said plurality of sub-fields,

and wherein said display method comprises:

receiving said video signal for, when said video signal represents said non-display gray level, diffusing temporally and/or spatially a difference between said non-display gray level and one of said display gray levels so that said non-display gray level can be equivalently displayed with said display gray levels;

converting a video signal representing one field processed by-diffusing into a video signal representing individual sub-fields; and

controlling said pixels on said display panel so that each pixel emits light or does not emit light in said individual sub-fields in accordance with said converted video signal representing said individual sub-fields.

9 (Previously Presented). The display method according to claim 8, wherein diffusing includes:

converting said non-display gray level into one of said display gray levels that is close to said non-display gray level, and

diffusing, when said non-display gray level is converted into said one of said display gray levels, a difference between said non-display gray level and said one of said display gray levels to pixels around a pixel having said non-display gray level.

10 (Withdrawn). The display method according to claim 8, wherein diffusing includes:

alternately adding or subtracting a difference between said non-display gray level and one of said display gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

11 (Withdrawn). The display method according to claim 8, wherein at least two continuous non-display gray levels are included between said display gray levels,

and wherein diffusing includes:

alternately adding or subtracting a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

converting another non-display gray level included in said at least two continuous non-display gray levels to a gray level close into said another non-display gray level among said display gray levels and a gray level rendered displayable in said step of adding or subtracting to diffuse, and

diffusing, when said another non-display gray level is converted, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

12 (Withdrawn). The display method according to claim 8, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display method further comprises:

receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

selecting the digital video signal processed by diffusing temporally and/or spatially when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is not

less than the minimum value of said non-display gray level or selecting the digital video signal obtained by diffusing said data of a bit lower by one digit when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is less than the minimum value of said non-display gray level.

13 (Withdrawn). The display method according to claim 8, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display method further comprises:

receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

selecting the digital video signal not processed by diffusing said data of a bit lower by one digit when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is not less than the minimum value of said non-display gray level or selecting the digital video signal obtained by diffusing said data of a bit lower by one digit when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is less than the minimum value of said non-display gray level,

and wherein diffusing temporally and/or spatially includes receiving the selected digital video signal, for alternately adding or subtracting a difference between said non-display gray level and one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

14 (Withdrawn). The display method according to claim 8, wherein said video signal is a digital video signal expressed by a plurality of bits, and

at least two continuous non-display gray levels are included between said display gray levels, and wherein said display method further comprises:

receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level,

selecting the digital video signal processed by diffusing temporally and/or spatially when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is not less than the minimum value of said non-display gray level or selecting the digital video signal obtained by diffusing said data of a bit lower by one digit when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is less than the minimum value of said non-display gray level, and

receiving the selected digital video signal, for alternately adding or subtracting a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

and wherein diffusing temporally and/or spatially includes:

converting another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a gray level rendered displayable in said step of adding or subtracting to diffuse, and

diffusing, when said another non-display gray level is converted, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

15 (Currently Amended). A display device providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual sub-fields that are defined by dividing one field and arranged on a time base in a prescribed order, said sub-fields being weighted to represent gray levels: levels;

wherein said plurality of sub-fields are weighted in such a way that at least one non-display gray level which cannot be displayed by combining said plurality of sub-fields is arranged between displayable gray levels by combining said plurality of sub-fields,

and wherein said display device comprises,

a diffusion circuit that receives said video signal for, when said video signal represents said non-display gray level, diffusing temporally and/or spatially a difference between said non-display gray level and one of said display gray levels so that said non-display gray level can be equivalently displayed with said display gray levels;

a sub-field corresponder that converts a video signal representing one field output from said diffusion circuit into a video signal representing individual sub-fields; and

an emitting circuit that controls said pixels on said display panel so that each pixel emits light or does not emit light in said individual sub-fields, in accordance with said video signal representing said individual sub-fields output from said sub-field corresponder.

16 (Previously Amended). The display device according to claim 15, wherein said diffusion circuit includes:

a gray level conversion table that converts said non-display gray level into one of said display gray levels that is close to said non-display gray level, and

an error diffusion circuit that diffuses, when said non-display gray level is converted into said one of said display gray levels by said gray level conversion table, a difference between said non-display gray level and said one of said display gray levels to pixels around a pixel having said non-display gray level.

17 (Withdrawn). The display device according to claim 15, wherein said diffusion circuit includes:

a dither diffusion circuit that alternately adds or subtracts a difference between said non-display gray level and one of said display gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

18 (Withdrawn). The display device according to claim 15, wherein at least two continuous non-display gray levels are included between said display gray levels, and

said diffusion circuit includes:

a dither diffusion circuit that alternately adds or subtracts a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

a gray level conversion table that converts another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a gray level rendered displayable by said dither diffusion circuit, and

an error diffusion circuit that diffuses, when said another non-display gray level is converted by said gray level conversion table, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

19 (Withdrawn). The display device according to claim 15, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display device further comprises,

a lower diffusion circuit that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

a selection circuit that selects an output of said diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is not less than the minimum value of said non-display gray level and selects an output of said lower diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is less than the minimum value of said non-display gray level and outputs the selected output to said sub-field corresponder.

20 (Withdrawn). The display device according to claim 15, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display device further comprises,

a lower diffusion circuit that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

a selection circuit that selects the digital video signal not yet diffused by said lower diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is not less than the minimum value of said non-display gray level and selects an output of said lower diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is less than the minimum value of said non-display gray level,

and wherein said diffusion circuit includes a dither diffusion circuit that receives the digital video signal output from said selection circuit, for alternately adding or subtracting a difference between said non-display gray level and one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

21. (Withdrawn) The display device according to claim 15, wherein said video signal is a digital video signal expressed by a plurality of bits,

at least two continuous non-display gray levels are included between said display gray levels,

and wherein said display device further comprises,

a lower diffusion circuit that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level,

a selection circuit that selects an output of said diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is not less than the minimum value of said non-display gray level and selects an output of said lower diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is less than the minimum value of said non-display gray level, and

a dither diffusion circuit that receives the digital video signal output from said selection circuit, for alternately adding or subtracting a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

said diffusion circuit includes:

a gray level conversion table that converts another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a gray level rendered displayable by said dither diffusion circuit, and

an error diffusion circuit that diffuses, when said another non-display gray level is converted by said gray level conversion table, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.